Response Under 37 CFR 1.116
Expedited Procedure
Examining Group 1700
Application No. 09/783,441
Paper Dated September 7, 2004
Attorney Docket No. 128346.32311

Amendments to the Claims

Listing of Claims

This listing of claims shall replace all prior versions and listings of claims in this application.

1. (Currently Amended) A three-dimensional faceted synthetic diamond crystal for use in a tool, the diamond crystal comprising at least one dopant element being selected from the group consisting of boron~~, nitrogen, hydrogen, lithium, nickel, cobalt, sodium, potassium~~, aluminum, ~~phosphorous, oxygen,~~ and combinations thereof, wherein nitrogen is dissolved in the crystal, and wherein the concentration of nitrogen exceeds the total concentration of dopant elements, and having a greater concentration toward or near an outermost surface of the crystal than in the center of the crystal, wherein the concentration of the dopant element is at a local minimum at least about 5 micrometers below the surface,

   wherein the concentration of the dopant element causes an expansion of the diamond lattice toward or near the outmost surface of the diamond crystal, the tangential compressive stresses being in the range of between about 10 and about 5000 megapascals (MPa);

   and wherein the generation of tangential compressive stresses increases the compressive fracture strength of the diamond as compared to a diamond crystal in which the diamond lattice is not substantially expanded.

2. (Cancelled)

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

6. (Currently Amended) The diamond crystal of claim 1 ~~5~~, wherein the concentration of nitrogen exceeds the total concentration of dopant elements by at least about 5 parts per million.

7. (Cancelled)

8. (Previously Presented) The diamond crystal according to claim 1, wherein the dopant element concentration within an outermost section of about 3 to about 50 micrometers of the crystal is in an amount of about 40 to about 10,000 parts per million.

9. (Original) A diamond crystal according to claim 1, wherein the concentration of the dopant element is at a local maximum at a distance less than about 5 micrometers from the surface of the crystal.

10. (Cancelled)

11. (Cancelled)

12. (Cancelled)

13. (Previously Presented) The diamond crystal of claim 1, wherein the increase in compressive fracture strength is at least about 2%.

14. (Cancelled)

15. (Cancelled)

16. (Previously Presented) The diamond crystal of claim 1, wherein the diamond crystal has a diameter of up to about 2 centimeters.

17. (Previously Presented) The diamond crystal of claim 1, wherein said crystal is a single crystal.

18. (Previously Presented) The diamond crystal of claim 1, having one or more twin planes.

19. (Cancelled)

20. (Previously Presented) The diamond crystal of claim 1, further comprising a coated film of doped diamond about 3 to about 50 micrometers thick on an outer surface of the diamond crystal, wherein the concentration of the dopant element in the coated film is about 40 to about 10,000 parts per million greater than the concentration of the dopant element in the outer surface of the underlying diamond crystal.

21. (Original) The diamond crystal of claim 20, wherein the dopant element is diffused into the diamond crystal, and the concentration of the dopant element is about 40 to about 10,000 parts per million at a depth of about 3 micrometers to about 50 micrometers within said diamond crystal.

22. (Cancelled)

23. (Withdrawn)

24. (Withdrawn)

25. (Original) The diamond crystal of claim 1, wherein the concentration of the dopant element within the diamond lattice increases with increasing radius from the local minimum.

26. (Currently Amended) A tool comprising a plurality of diamond crystals embedded therein, wherein each of the plurality of diamond crystals has a diamond lattice and comprises at least one dopant element <u>selected from the group consisting of boron, aluminum, and combinations thereof, wherein nitrogen is dissolved in the crystal, and wherein the concentration of nitrogen exceeds the total concentration of dopant elements, and</u> wherein the dopant element is present in a concentration that causes the diamond lattice to expand toward or near an outermost surface of the crystal, thereby generating tangential compressive stresses at the surface of the crystal which increase the compressive fracture strength of the diamond crystal.

27. (Original) The tool of claim 26, wherein the tool is a tool selected from the group consisting of grinding wheels, dressing tools for grinding wheels, truing tools for grinding wheels, and saw blades.

28. (Currently Amended) A tool comprising a plurality of diamond crystals embedded therein, wherein each of the plurality of diamond crystals is a three-dimensional faceted synthetic diamond crystal having a diamond lattice and comprising at least one dopant element, the dopant element being selected from the group consisting of boron~~,~~ ~~nitrogen, hydrogen, lithium, nickel, cobalt, sodium, potassium~~, aluminum, ~~phosphorous,~~ ~~oxygen,~~ and combinations thereof, wherein nitrogen is dissolved in the crystal, and wherein the concentration of nitrogen exceeds the total concentration of dopant elements, the dopant element being present in a concentration that is greater toward or near an outermost surface of the diamond crystal than in the center of the diamond crystal, the concentration of the dopant element having a local minimum at least about 5 micrometers below the surface, wherein the concentration of the dopant element causes the diamond lattice to expand toward or near the outermost surface, thereby generating tangential compressive stresses in the range of between about 10 to about 5000 megapascals (MPa) at the surface of the crystal which increases the compressive fracture strength of the diamond crystal.

29. (Cancelled)

30. (Cancelled)

31. (Cancelled)

32. (Currently Amended) The tool of claim 28 ~~31~~, wherein the concentration of nitrogen exceeds the total concentration of dopant elements by at least about 5 parts per million.

33. (Cancelled)

34. (Original) The tool of claim 28, wherein the dopant element concentration within an outermost section of about 3 to about 50 micrometers of the diamond crystal is in an amount of about 40 to about 10,000 parts per million.

35. (Original) The tool of claim 28, wherein the concentration of the dopant element is at a local maximum at a distance less than about 5 micrometers from the surface of the diamond crystal.

36. (Original) The tool of claim 28, wherein the increase in compressive fracture strength of the diamond crystal is at least about 2%.

37. (Original) The tool of claim 28, wherein the concentration of the dopant element within the diamond lattice increases with increasing radius from the local minimum crystal.

38. (Original) The tool of claim 28, wherein the diamond crystal has a diameter up to about 2 centimeters.

39. (Original) The tool of claim 28, wherein each of the plurality of diamond crystals is a single crystal.

40. (Original) The tool of claim 28, wherein each of the plurality of diamond crystals further comprises a coated film of doped diamond disposed on an outer surface of the diamond crystal, the coated film being about 3 to about 50 micrometers thick, wherein the concentration of the dopant element in the coated film is about 40 to about 10,000 parts per million greater than the concentration of the dopant element in the outer surface of the underlying diamond crystal.

41. (Original) The tool of claim 40, wherein the dopant element is diffused into the diamond crystal, and the concentration of the dopant element is about 40 to about 10,000 parts per million at a depth of about 3 micrometers to about 50 micrometers within said diamond crystal.

42. (Original) The tool of claim 28, wherein the tool is a tool selected from the group consisting of grinding wheels, dressing tools for grinding wheels, truing tools for grinding wheels, and saw blades.